

PTC-1449 REPRODUCED

ATTORNEY DOCKET NO.
0717.2033-002APPLICATION NO.
10/608,780INFORMATION DISCLOSURE CITATION
IN AN APPLICATIONFIRST NAMED INVENTOR
Jagdish NarayanFILING DATE
June 27, 2003

March 24, 2004

EXAMINER
Not yet assignedCONFIRMATION NO.
8117GROUP
2811

(Use several sheets if necessary)

U.S. PATENT DOCUMENTS

EXAM- INER INI- TIAL	REF. NO.	DOCUMENT NUMBER Number-Kind Code (if known)	ISSUE DATE / PUBLICATION DATE MM-DD-YYYY	NAME OF PATENTEE OR APPLICANT OF CITED DOCUMENT
BT	AA	4,153,905	05-08-1979	Charmakadze <i>et al.</i>
	AB	4,495,514	01-22-1985	Lawrence <i>et al.</i>
	AC	4,670,088	06-02-1987	Tsaur <i>et al.</i>
	AD	4,946,548	08-07-1990	Kotaki <i>et al.</i>
	AE	4,966,862	10-30-1990	Edmond
	AF	5,091,333	02-25-1992	Fan <i>et al.</i>
	AG	5,210,051	05-11-1993	Carter, Jr.
	AH	5,239,188	08-24-1993	Takeuchi <i>et al.</i>
	AI	5,247,533	09-21-1993	Okazaki <i>et al.</i>
	AJ	5,272,108	12-21-1993	Kozawa
	AK	5,278,433	01-11-1994	Manabe <i>et al.</i>
	AA2	5,281,830	01-25-1994	Kotaki <i>et al.</i>
	AB2	5,285,078	02-08-1994	Mimura <i>et al.</i>
	AC2	5,290,393	03-01-1994	Nakamura
	AD2	5,306,662	04-26-1994	Nakamura <i>et al.</i>
	AE2	5,323,022	06-21-1994	Glass <i>et al.</i>
	AF2	5,334,277	08-02-1994	Nakamura
	AG2	5,369,289	11-29-1994	Tamaki <i>et al.</i>
	AH2	5,385,862	01-31-1995	Moustakas
	AI2	5,406,123	04-11-1995	Narayan
	AJ2	5,408,120	04-18-1995	Manabe, <i>et al.</i>
	AK2	5,433,169	07-18-1995	Nakamura
	AA3	5,468,678	11-21-1995	Nakamura <i>et al.</i>
	AB3	5,578,839	11-26-1996	Nakamura, <i>et al.</i>
	AC3	5,563,422	10-08-1996	Nakamura, <i>et al.</i>
DN	AD3	5,652,434	07-29-1997	Nakamura, <i>et al.</i>

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PN	AE3	5,686,738	11-11-1997	Moustakas
	AF3	5,733,796	03-31-1998	Manabe <i>et al.</i>
	AG3	5,734,182	03-31-1998	Nakamura <i>et al.</i>
	AH3	5,747,832	05-05-1998	Nakamura <i>et al.</i>
	AI3	5,751,752	05-12-1998	Shakuda
	AJ3	5,767,581	06-16-1998	Nakamura <i>et al.</i>
	AK3	5,777,350	07-07-1998	Nakamura <i>et al.</i>
	AA4	5,828,684	10-27-1998	Van de Walle
	AB4	5,850,410	12-15-1998	Kuramata
	AC4	5,877,558	03-02-1999	Nakamura <i>et al.</i>
	AD4	5,880,486	03-09-1999	Nakamura <i>et al.</i>
	AE4	5,905,276	05-18-1999	Manabe <i>et al.</i>
	AF4	5,959,307	09-28-1999	Nakamura <i>et al.</i>
	AG4	5,998,925	12-07-1999	Shimizu <i>et al.</i>
	AH4	6,017,774	01-25-2000	Yuasa, <i>et al.</i>
	AI4	6,051,849	04-18-2000	Davis <i>et al.</i>
	AJ4	6,066,861	05-23-2000	Höhn <i>et al.</i>
	AK4	6,069,440	05-30-2000	Shimizu <i>et al.</i>
	AA5	6,078,063	06-20-2000	Nakamura <i>et al.</i>
	AB5	6,084,899	07-04-2000	Shakuda
	AC5	6,093,965	07-25-2000	Nakamura <i>et al.</i>
	AD5	6,115,399	09-05-2000	Shakuda
	AE5	6,153,010	11-28-2000	Kiyoku <i>et al.</i>
	AF5	6,172,382 B1	01-09-2001	Nagahama <i>et al.</i>
	AG5	6,204,512 B1	03-20-2001	Nakamura <i>et al.</i>
PN	AH5	6,215,133 B1	04-10-2001	Nakamura <i>et al.</i>

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<i>PN</i>	AI5	6,245,259 B1	06-12-2001	Höhn <i>et al.</i>
	AJ5	6,249,012 B1	06-19-2001	Manabe <i>et al.</i>
	AK5	6,337,493 B1	01-08-2002	Tanizawa <i>et al.</i>
	AA6	6,362,017 B1	03-26-2002	Manabe <i>et al.</i>
	AB6	US 2001/0022367 A1	09-20-2001	Nakamura <i>et al.</i>
	AC6	US 2001/0030318 A1	10-18-2001	Nakamura <i>et al.</i>
	AD6	US 2002/0046693 A1	04-25-2002	Kiyoku <i>et al.</i>
	AE6	US 2002/0060326 A1	05-23-2002	Manabe <i>et al.</i>
	AF6	US 2003/0199171 A1	10-23-2003	Rice <i>et al.</i>
	AG6	US 2003/0160246 A1	08-28-2003	Narayan <i>et al.</i>
	AH6	US 2001/0028062 A1	10-11-2001	Uemura <i>et al.</i>
	AI6	US 2003/0222263 A1	12-04-2003	Choi
	AJ6	US 2004/0000672 A1	01-01-2004	Fan <i>et al.</i>
	AK6	US 2004/0000671 A1	01-01-2004	Oh <i>et al.</i>
	AA7	US 2004/0000670 A1	01-01-2004	Oh <i>et al.</i>
	AB7	US 2001/0050375 A1	12-13-2001	Van Dalen
	AC7	5,383,088	01-17-1995	Chapple-Sokol <i>et al.</i>
	AD7	6,287,947 B1	09-11-2001	Ludowise <i>et al.</i>
	AE7	6,475,854 B2	11-05-2002	Narwankar <i>et al.</i>
	AF7	6,255,129 B1	07-03-2001	Lin
	AG7	6,097,040	08-01-2000	Morimoto <i>et al.</i>
	AH7	6,067,222	05-23-2000	Hausmann
	AI7	4,625,182	11-25-1986	Bovino <i>et al.</i>
	AJ7	6,241,344 B1	06-05-2001	Machida
	AK7	5,516,731	05-14-1996	Toutouchi <i>et al.</i>
<i>PN</i>	AA8	5,834,326	11-10-1998	Miyachi <i>et al.</i>

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FOREIGN PATENT DOCUMENTS						
		DOCUMENT NUMBER Country Code-Number-Kind Code (if known)	DATE MM-DD-YYYY	NAME OF PATENTEE OR APPLICANT OF CITED DOCUMENT	TRANSLATION YES NO	
PL	AL	JP9167857 (abstract only)	06-24-1997	Toshiba Corp		
	AM	JP 52/028887	03-04-1977	Fujitsu LTD		X
	AN	JP 05-243614	09-21-1993	Sharp Corp		X
	AO	JP 4236478	08-25-1992	Pioneer Electron Corp		X
	AP	JP 03-218625	09-26-1991	Univ Nagoya		X
	AQ	JP 03-252177 (abstract only)	11-11-1991	Toyoda Gosei Co LTD Toyoda Central Res & Dev Lab Univ Nagoya Res Dev Corp of Japan		
	AL2	JP 54-093380	07-24-1979	Fujitsu LTD		X
	AM2	JP 9092880 (abstract only)	04-04-1997	Toyoda Gosei Co LTD		
	AN2	JP 8213692	08-20-1996	Hitachi LTD		X
	AO2	JP 11145513 (abstract only)	05-28-1999	Sharp Corp		
	AP2	JP 04-068579	03-04-1992	Sharp Corp		X
	AQ2	JP 02-229475	09-12-1990	Nippon Telegr & Teleph Corp		X
	AL3	JP 04-242985 (abstract only)	08-31-1992	Toyoda Gosei Co LTD Akasaki Isamu Amano Hiroshi		
	AM3	JP9134881 (abstract only)	05-20-1997	Matsushita Electron Corp		
	AN3	JP 59-228776	12-22-1984	Nippon Telegr & Teleph Corp		X
	AO3	JP 06-177423	06-24-1994	Nichia Chem Ind LTD		X
	AP3	JP 06-268259	09-22-1994	Nichia Chem Ind LTD		X
	AQ3	JP 02-229475	09-12-1990	Nippon Telegr & Teleph Corp		X
	AL4	JP 2229475	09-12-1990	Nippon Telegr & Teleph Corp		X
	AM4	JP 06-021511	01-28-1994	Nippon Telegr & Teleph Corp		X
	AN4	JP 4209577	07-30-1992	Nippon Telegr & Teleph Corp		X
	AO4	JP 61-056474	03-22-1986	Matsushita Electric Ind Co LTD		X
PL	AP4	JP 8167735	06-25-1996	Hitachi Cable LTD		X



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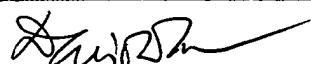
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)		
AR	DR	Foresi, J.S. and Moustakas, T.D., "Metal contacts to gallium nitride," <i>Appl. Phys. Lett.</i> 62(22):2859-2861 (1993).
AS		Nakamura, S., "InGaN blue - light - emitting diodes," <i>Journal of the Institute of Electronics, Information and Communication Engineers</i> 76(9):913-917 (1993) (Abstract).
AT		Akasaki, I. and Amano, H., "High efficiency UV and blue emitting devices prepared by MOVPE and low energy electron beam irradiation treatment," <i>Physical Concepts of Materials for Novel Optoelectronic Device Applications</i> , 1361:138-149 (1990).
AU		Amano, H., <i>et al.</i> , "P-Type Conduction in Mg-Doped GaN Treated with Low-Energy Electron Beam Irradiation (LEEPI)," <i>Japanese Journal of Applied Physics</i> 28(12):L2112-L2114 (1989).
AV		Andreev, V.M., <i>et al.</i> , "Luminescence Properties of i-n, i-n-i and n-i-n Structures Made of Epitaxial Layers GaN/ α -Al ₂ O ₃ ," <i>Journal of Luminescence</i> 35:9-16 (1986).
AW		Boulou, M., <i>et al.</i> , "Recombination Mechanisms in GaN:Zn," <i>Journal of Luminescence</i> 18/19:767-770 (1979).
AX		Casey, Jr., H.C. and Panish, M.B., "SLAB-Dielectric Waveguides," in <i>Heterostructure Lasers</i> , (NY: Academic Press), pp. 32-35 (1978).
AY		Goldenberg, B., <i>et al.</i> , "Ultraviolet and violet light-emitting GaN diodes grown by low-pressure metalorganic chemical vapor deposition," <i>Appl. Phys. Lett.</i> 62(4):381-383 (1993).
AZ		F. Goodenough, "Exotic Semiconductors Showcased at the IEDM," <i>Electronic Design</i> , pp. 60, 62, 64-66, 68 (1994).
AR2		Hayashi, I., <i>et al.</i> , "Junction Lasers Which Operate Continuously at Room Temperature," <i>Appl. Phys. Lett.</i> 17(3):109-111 (1970).
AS2		Jacob, G., <i>et al.</i> , "GaN Electroluminescent Devices: Preparation and Studies," <i>Journal of Luminescence</i> 17:263-282 (1978).
AT2		Jang, J.-S., <i>et al.</i> , "High Quality Non-Alloyed Pt Ohmic Contacts to P-Type GaN Using Two-Step Surface Treatment," <i>MRS Internet J. Nitride Semiconductor Res.</i> F99W10.4.
AU2	DR	Kaminska, E., <i>et al.</i> , "Ni/Si-Based Contacts to GaN: Thermally Activated Structural Transformations Leading to Ohmic Behavior," <i>MRS Internet J. Nitride Semicond. Res.</i> 4S1, G9.9.



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	AV2	Kampen, T.U. and Mönch, W., "Metal Contacts on a-GaN," <i>MRS Internet J. Nitride Semicond. Res.</i> 1(41).
	AW2	Madar, R., "High Pressure Solution Growth of GaN*," <i>Journal of Crystal Growth</i> 31:197-203 (1975).
	AX2	Matsuoka, T., "Growth and Properties of a Wide-Gap Semiconductor InGa _N ," <i>Optoelectronics</i> 5(1):53-64 (1990).
	AY2	T. Matsuoka, "Current status of GaN and related compounds as wide-gap semiconductors," <i>Journal of Crystal Growth</i> 124:433-438 (1992).
	AZ2	Nakamura, S., <i>et al.</i> , "High-power InGa _N /Ga _N double-heterostructure violet light emitting diodes," <i>Appl. Phys. Lett.</i> 62(19):2390-2392 (1993).
	AR3	Nakamura, S., <i>et al.</i> , "P-GaN/N-InGa _N /N-GaN Double-Heterostructure Blue-Light-Emitting Diodes," <i>Jpn. J. Appl. Phys.</i> 32:L8-L11 (1993).
	AS3	S. Nakamura, "Growth of In _x Ga _(1-x) N compound semiconductors and high-power InGa _N /AlGa _N double heterostructure violet-light-emitting diodes," <i>Microelectronics Journal</i> 25:651-659 (1994).
	AT3	Nakamura, S., <i>et al.</i> , "High-Power GaN P-N Junction Blue-Light-Emitting Diodes," <i>Japanese Journal of Applied Physics</i> 30(12A):L1998-L2001 (1991).
	AU3	Nakamura, S., "InGa _N /AlGa _N Double-Heterostructure Blue LEDs," <i>Mat. Res. Soc. Symp. Proc. Vol.</i> 339:173-178 (1994).
	AV3	Nakamura, S., <i>et al.</i> , "Thermal Annealing Effects on P-Type Mg-Doped GaN Films," <i>Jpn. J. Appl. Phys.</i> 31:L139-L142 (1992).
	AW3	Nakamura, S., "Zn-doped InGa _N growth and InGa _N /AlGa _N double-heterostructure blue-light-emitting diodes," <i>Journal of Crystal Growth</i> 145:911-917 (1994).
	AX3	Nakamura, S., <i>et al.</i> , "High-brightness InGa _N /AlGa _N double-heterostructure blue-green-light-emitting diodes," <i>J. Appl. Phys.</i> 76(12):8189-8191 (1994).
	AY3	Nakamura, S., <i>et al.</i> , "Cd-Doped InGa _N Films Grown on GaN Films," <i>Jpn. J. Appl. Phys.</i> 32:L338-L341 (1993).











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	AZ3	Nakamura, S., "High-Power InGaN/AlGaIn Double-Heterostructure Blue-Light-Emitting Diodes," Int'l Electronic Devices Meeting 94:567-570 (1994).
	AR4	Piotrowska, A., et al., "Ohmic Contacts to III-V Compound Semiconductors: A Review of Fabrication Techniques," <i>Solid-State Electronics</i> 26(3):179-197 (1983).
	AS4	Sporken, R., et al., "XPS study of Au/GaN and Pt/GaN contacts," <i>MRS Internet J. Nitride Semiconductor Res.</i> 2(23)(1997).
	AT4	Venugopalan, H.S., et al., "Phase Formation and Morphology in Nickel and Nickel/Gold Contacts To Gallium Nitride," <i>MRS Internet Journal Nitride Semiconductor Research</i> (1997) <URL:http://nsr.mij.mrs.org/MRS/S97-D/4.10>.
	AU4	Zhou, L., et al., "Characteristics of Ti/Pt/Au Ohmic Contacts on p-type GaN/Al _x Ga _{1-x} N Superlattices," <i>MRS Internet J. Nitride Semicond. Res.</i> F99W10.3.
	AV4	Dovidenko, K., et al., "Aluminum nitride films on different orientations of sapphire and silicon," <i>J. Appl. Phys.</i> 79(5): 2439-2445, (1996).
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	AX4	Lin, Y.S., et al., "Dependence of composition fluctuation on indium content in InGaIn/GaN multiple quantum wells," <i>Appl. Phys. Lett.</i> , 77(19): 2988-2990, (2000).
	AY4	Narukawa, Y., et al., "Dimensionality of excitons in laser-diode structures composed of In _x Ga _{1-x} N multiple quantum wells," <i>Phys. Rev. B</i> , 59(15): 10283-10288, (1999).
	AZ4	Kawakami, Y., et al., "Dynamics of optical gain in In _x Ga _{1-x} N multi- quantum well-based laser diodes," <i>Appl. Phys. Lett.</i> , 77(14): 2151-2153, (2000).
	AR5	Strite, S., and Morkoc, H., "GaN, AlN, and InN: A review," <i>J. Vac. Sci. Technol. B</i> , 10(4):1237-1266, (1992).
	AS5	Hassan, K.M., et al., "Optical and structural studies of Ge nanocrystals embedded in AlN matrix fabricated by pulsed laser deposition," <i>Appl. Phys. Lett.</i> , 75(9): 1222-1224, (1999).
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	AU5	Narukawa, Y., <i>et al.</i> , "Role of self-formed InGaN quantum dots for exciton localization in the purple laser diode emitting at 420 nm," <i>Appl. Phys. Lett.</i> , 70(8): 981-983, (1997).
	AV5	Nakamura, S., "The Roles of Structural Imperfections in InGaN-Based Blue Light-Emitting Diodes and Laser Diodes," <i>Science Magazine</i> , 1-14, [retrieved online 2000-08-08]. Retrieved from the Internet <URL: http://www.science.org/cgi/content/full/281/5379/956 >.
	AW5	Chichibu, S., <i>et al.</i> , "Spatially resolved cathodoluminescence spectra of InGaN-quantum wells," <i>App. Phys. Lett.</i> , 71(16): 2346-2348, (1997).
	AX5	Queisser, H.J., <i>et al.</i> , "Defects in Semiconductors: Some Fatal, Some Vital," <i>Science</i> , 281:945-950 (1998).
	AY5	LeGoues, F. K., <i>et al.</i> , "Cyclic Growth of Strain-Relaxed Islands," <i>Physical Review Letters</i> , 73(2):300-303 (1994).
	AZ5	Mahajan, S., "Defects in Semiconductors and Their Effects on Devices," <i>Acta Materialia</i> , 48:137-149 (2000).
	AR6	Matthews, J.W., <i>et al.</i> , "Defects in Epitaxial Multilayers," <i>Journal of Crystal Growth</i> , 27:118-125 (1974).
	AS6	Narayan, J., <i>et al.</i> , "Mechanism of Formation of 60° and 90° Misfit Dislocations in Semiconductor Heterostructures," <i>Materials Science and Engineering</i> , B10:261-267 (1991).
	AT6	Narayan, J., <i>et al.</i> , "Epitaxial Growth of TiN Films on (100) Silicon Substrates by Laser Physical Vapor Deposition," <i>Applied Physics Letters</i> , 61(11):1290-1293 (1992).
	AU6	Matthews, J.W., "Coherent Interfaces and Misfit Dislocations," In <i>Epitaxial Growth Part B</i> , (Academic Press New York) Ch. 8, pp. 560-609 (1975)

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